Using Pavement Management Software to Optimize Your Pavement Preservation Program –

The Montgomery County

Introduction by:

Randy Paugh, Pavement Management Engineer,
Montgomery County Division of Highway Services

Presented by:

Alan Kercher P.E., President, Kercher Engineering, Inc.

Topics to be Covered

- Overview of Comprehensive Pavement Management
- What Functionality Should a County's PMS Software Have?
  - Montgomery County Story

Comprehensive Pavement Management

- More than just Software
- Cradle to Grave Approach
  - Project-specific Designs
    - Utilizing the Toolbox
  - Project-specific Contract Documents
  - Thorough Inspection
- Land Development
  - Ensuring Durability of New Infrastructure
- Utilities

Utilize the Entire Tool Box

Should Have Been CIR

Should Have Been FDR

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Design and Build it Correctly

4 Projects - All <6-Months Old

Destroyed by Utility Cuts

Utility Cuts - Planned Destruction

Pavement Management Software to Optimize Your Pavement Preservation Program

The Montgomery County Story

Montgomery County Pavement Management System

- 24,000 Segments
- Management Setup
  - Compatible to County Practices
- Created Street Inventory File
  - Data Compatible with County's GIS Data
- Initial Road Rating Data Completed
  - June 2008 to August 2008

Goals

- Network Level Planning Tool
  - Predicting the Future
  - Rigorous Budget Analysis
- Project Level Tools
  - Historical Database
  - Design Tool
- Automating Project List Process
  - Neighborhoods
- Integration with other Departments/Agencies

Pavement Management Software

- Budget Analysis Tool
- Project Level Design Tool
- Research Tool

Network Level

- Budget Analysis - What if scenarios
  - Status Quo
  - Increase Budget
  - Decrease Budget
- Repair Strategies
  - Optimized vs. Worst First
  - CIR vs. Remove and Replace
- Goal Setting

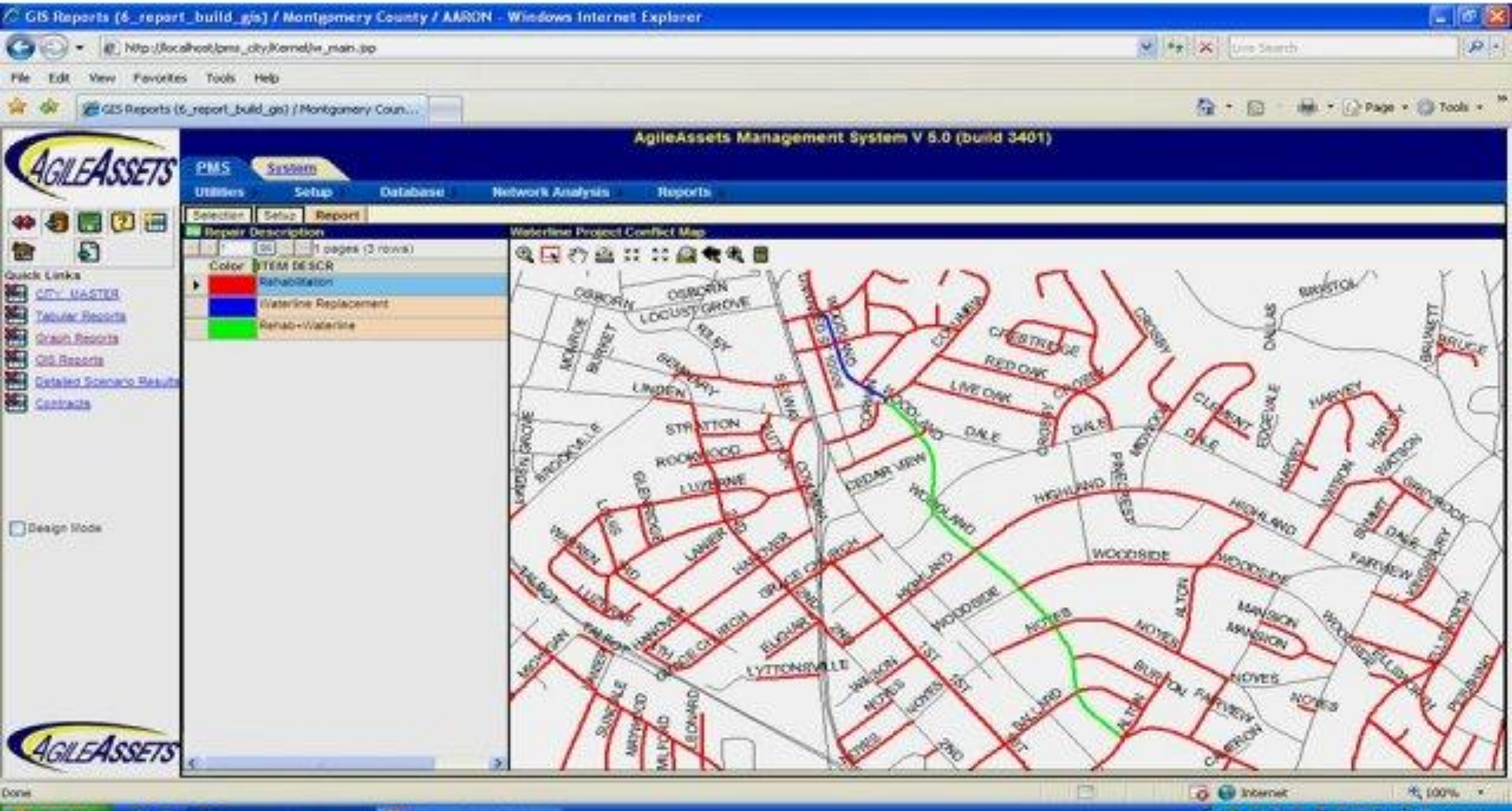
Configuration

- Unique Pavement Types
  - Thick Pavements vs. Thin Pavements
  - High Traffic vs. Low Traffic
  - GABC Base vs. Recycled Base
  - Hot Mix w/ Micro-Surfacing vs. No Micro-surfacing
- Different Treatments by Classification, etc.
  - Multiple Decision Trees
- Unique Performance Models

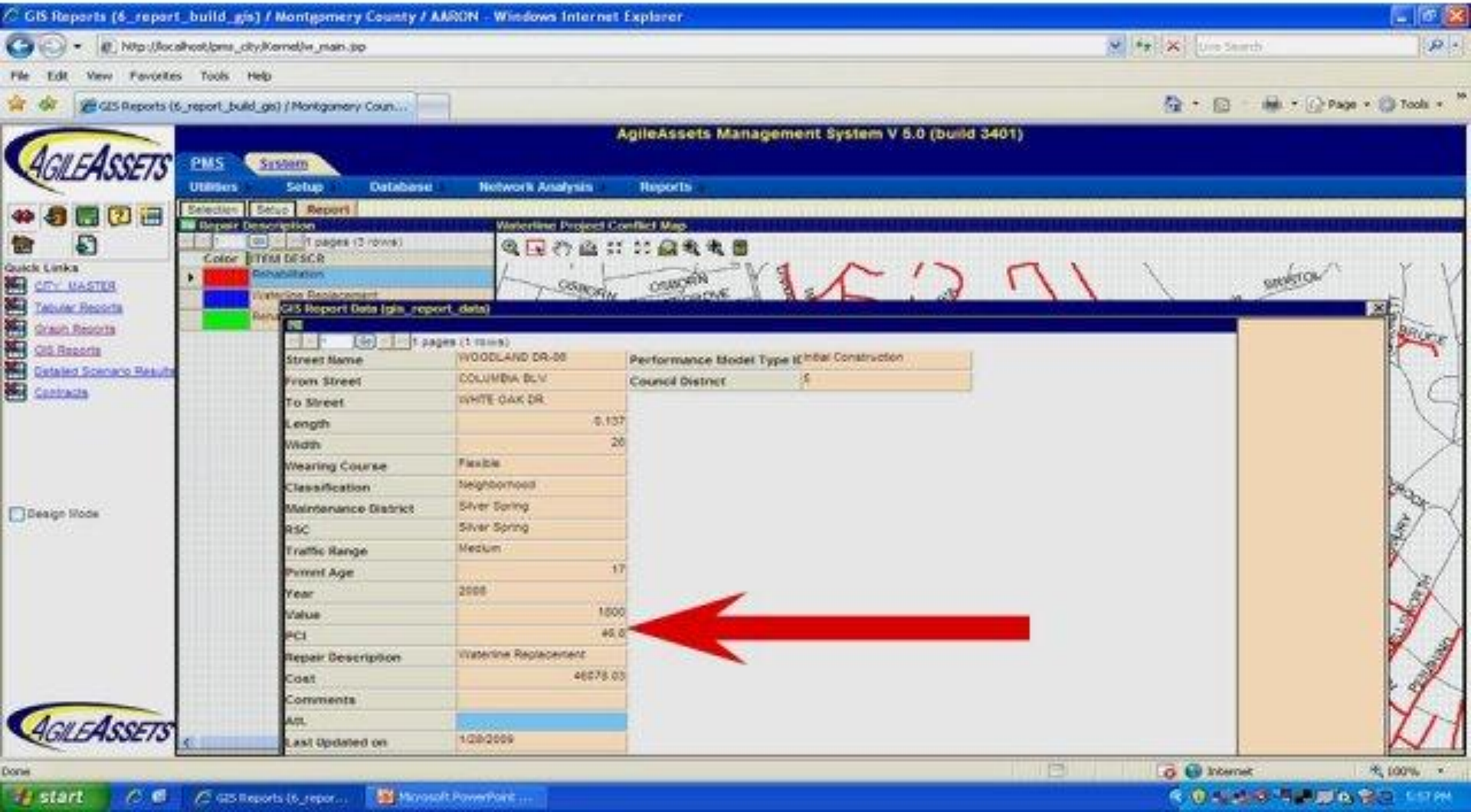
Integration with Asset Management:

- Sidewalks
  - ADA, Walkable Communities, Safe Routes to School, etc.
- Safety Improvements
  - Realignments, Intersections, Friction, etc.
- Drainage/Utilities
  - Cut Policies, Coordinate Activities, etc.
    - WSSC

GIS Map - Waterline Project Conflicts



GIS Map - Waterline Project Conflicts Pop Window



Montgomery County Pavement Management System

- Implementation Started - May 2009
  - Management Setup
  - Optimization Analyses, Multi-year Funding Reports and Backlog (Benefit) Reports
  - Completed August 2009

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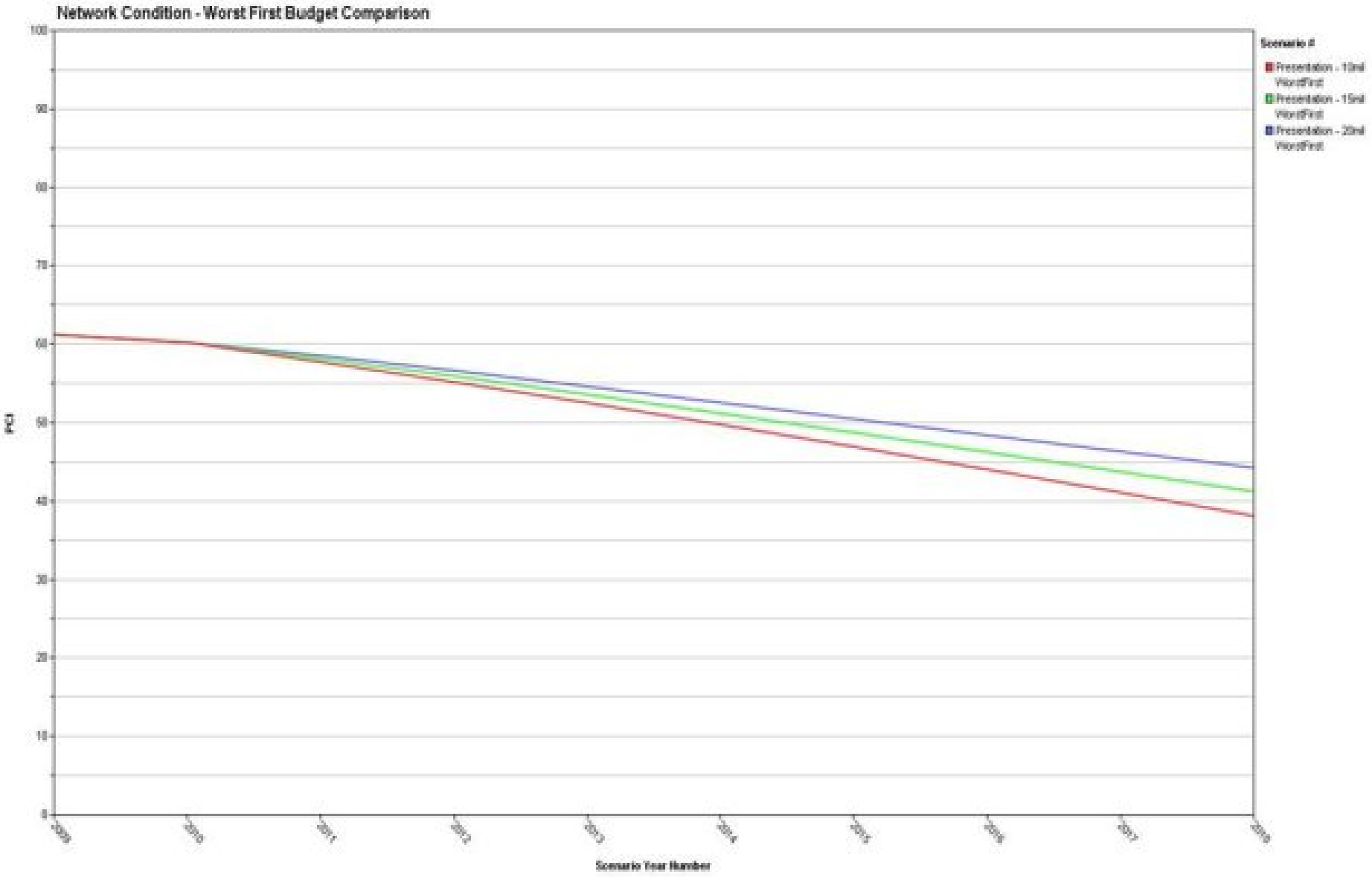
Backlog Analysis

aka "Monetary Impact" of Deterioration

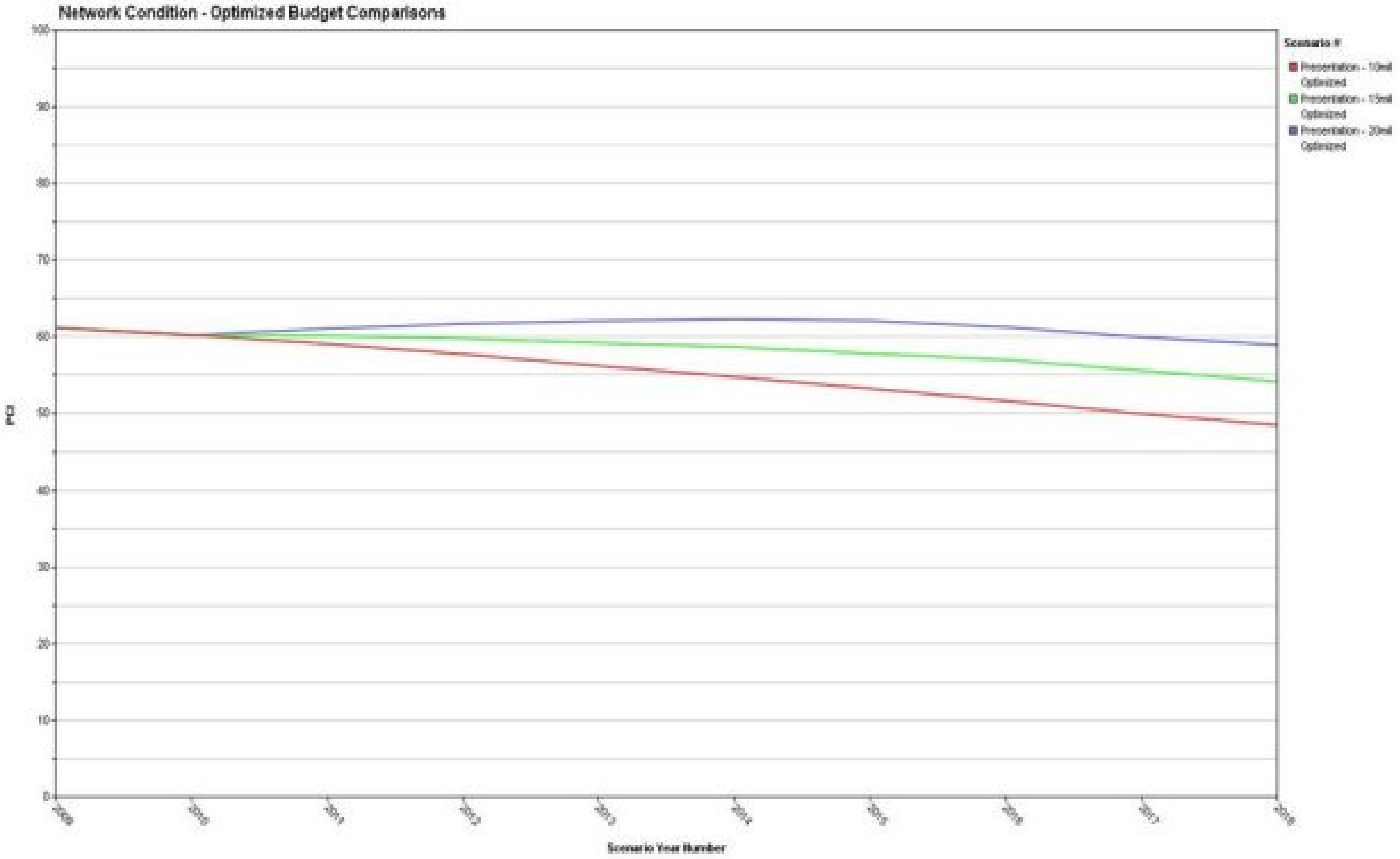
Benefits of Optimization

"Sustainability"

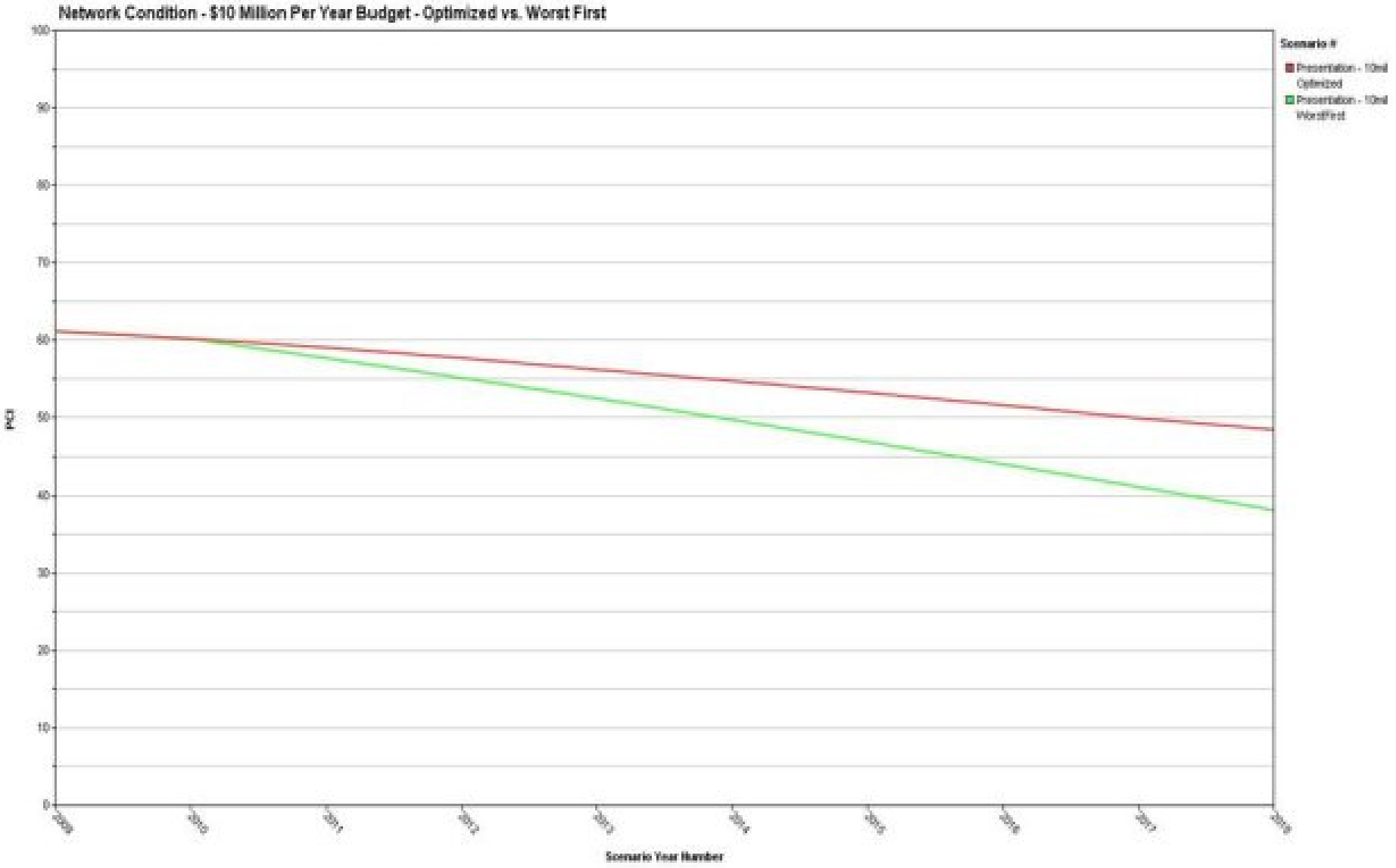
Worst-First Budgets

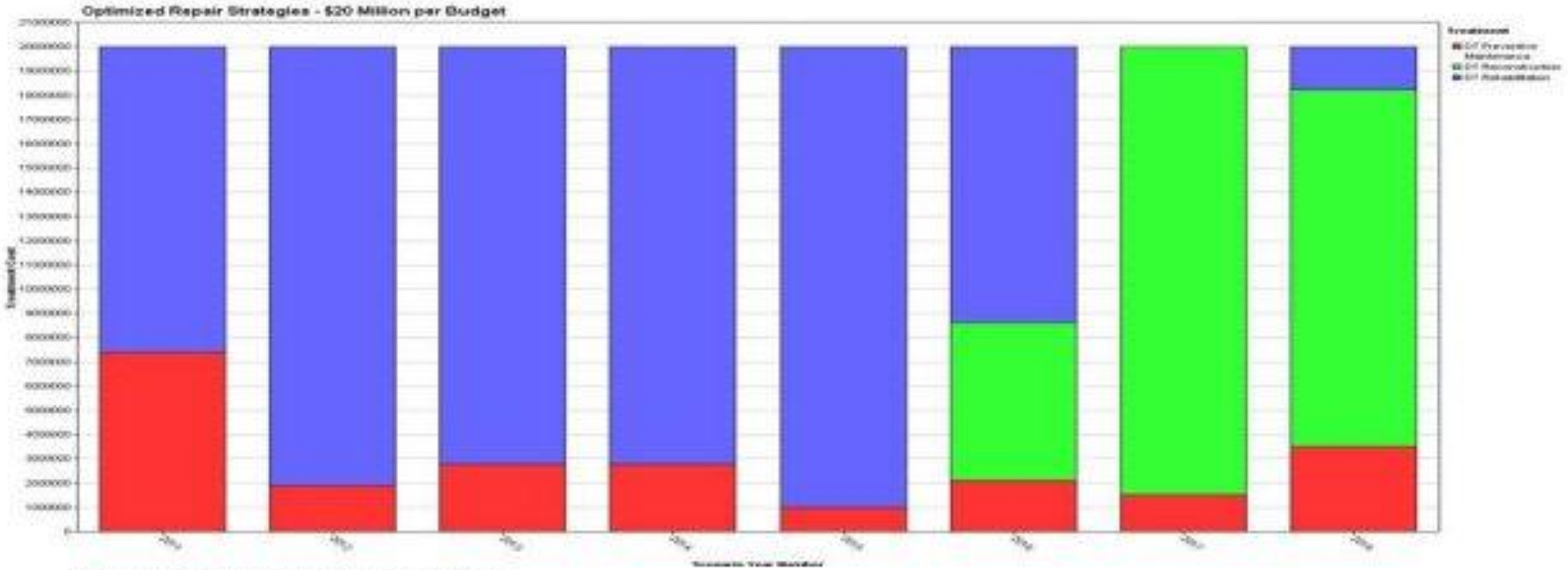


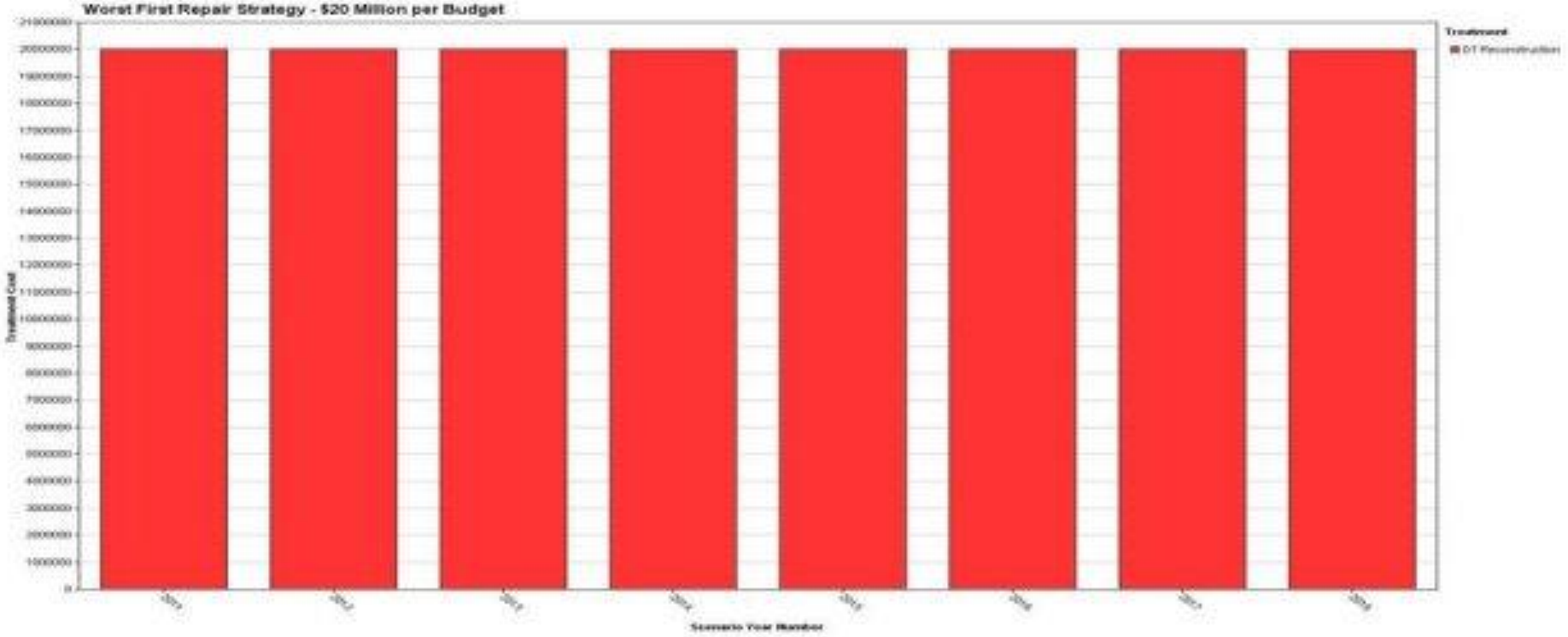
Optimized Budgets



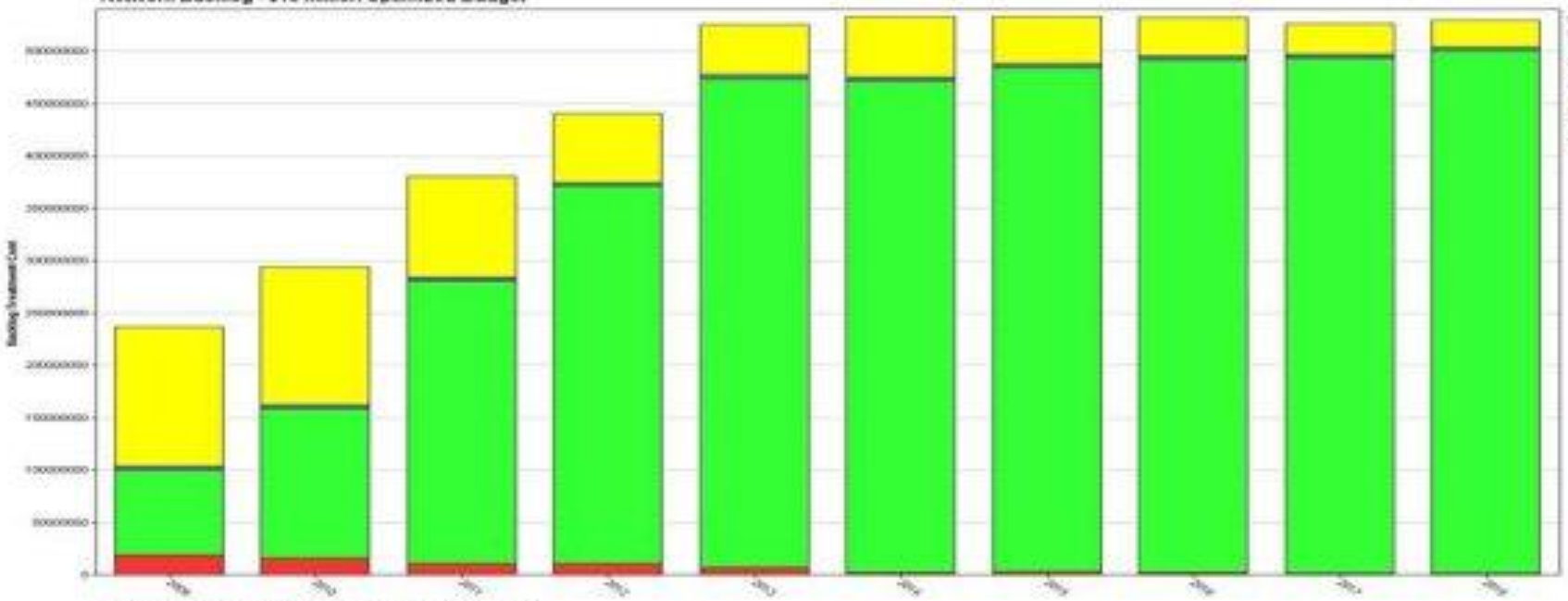
Worst-First vs. Optimized
$10 Mil./Yr.



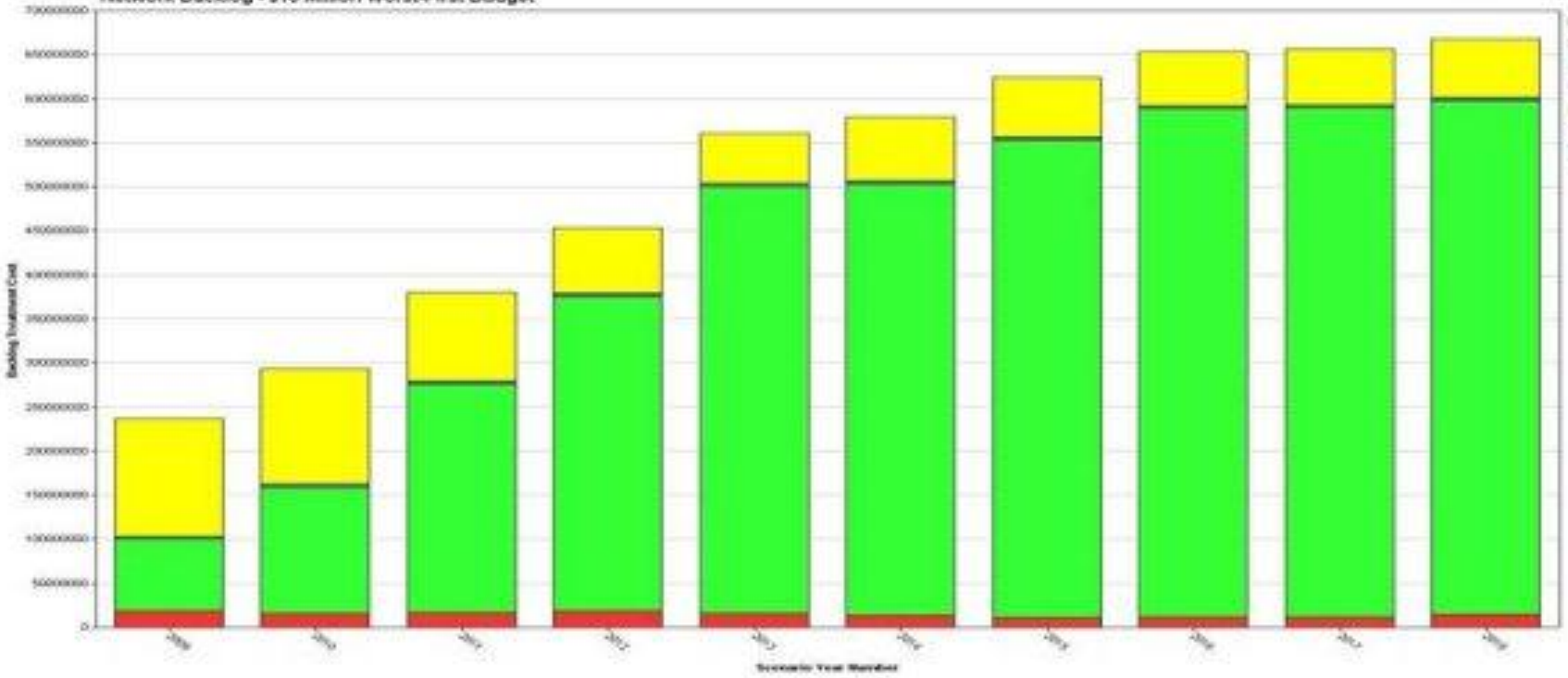

Optimized Repair Strategies - $20 Million per Budget
Treatment
DT Preventive Maintenance
DT Reconstruction
DT Reconstruction

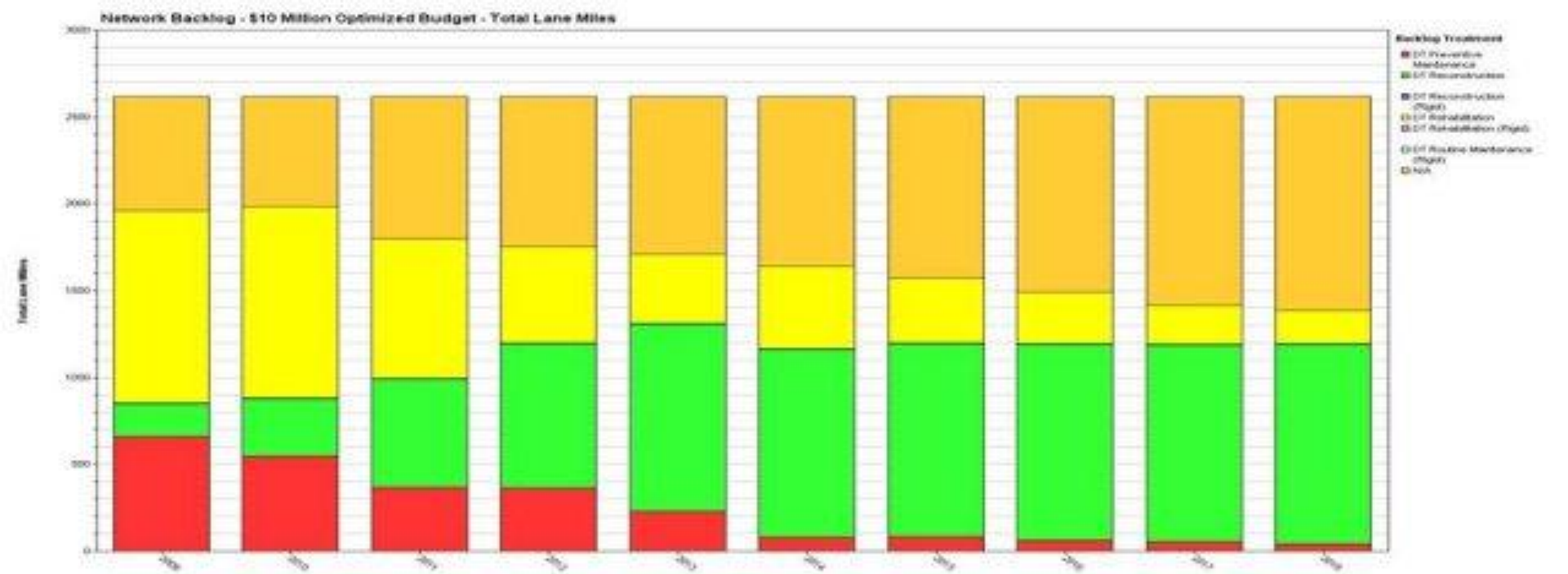

Worst First Repair Strategy - $20 Million per Budget
Treatment
DT Reconstruction

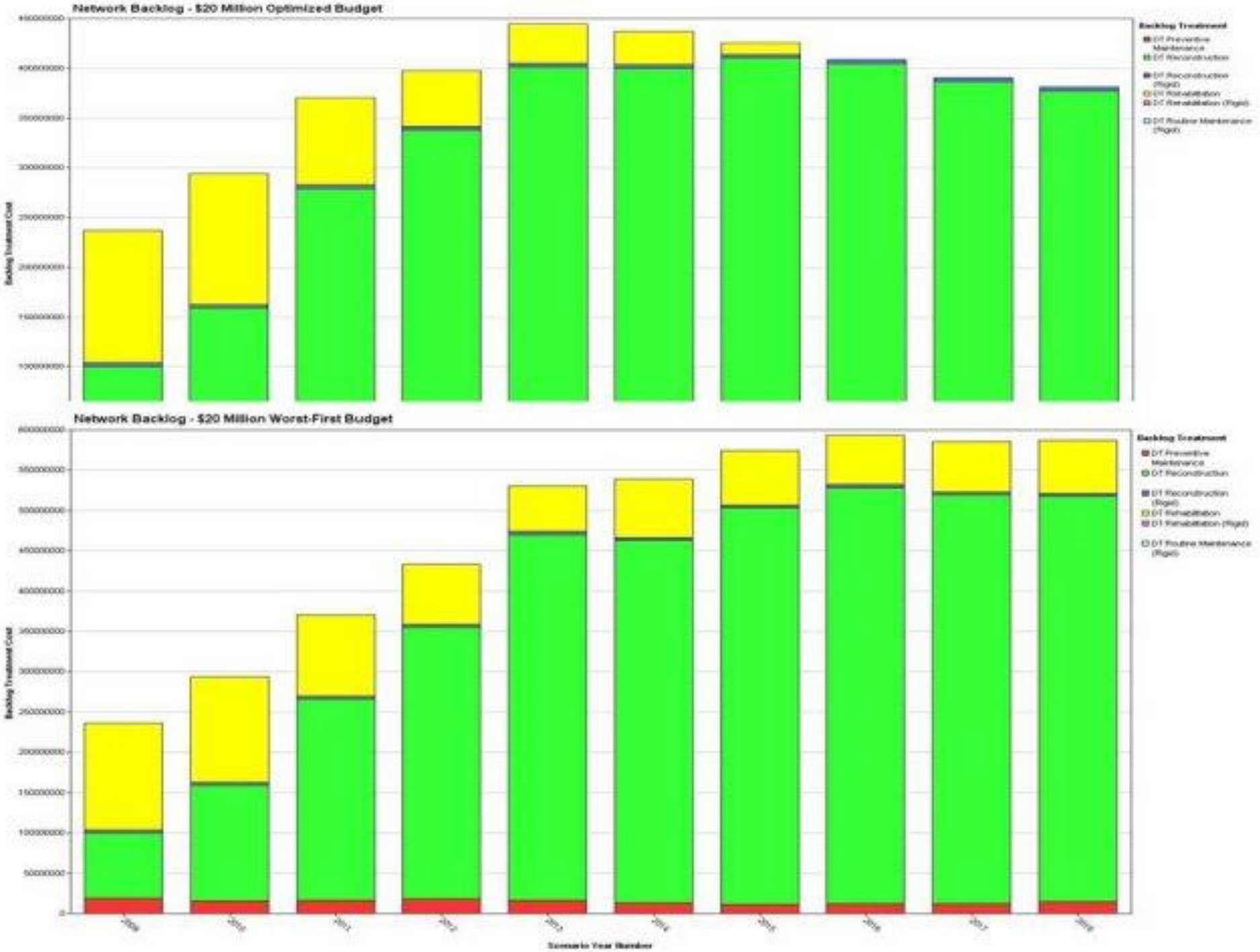
Network Backlog - $10 Million Optimized Budget



Network Backlog - $10 Million Worst-First Budget




Network Backlog - $10 Million Optimized Budget - Total Lane Miles
Backlog Treatment
Network Backlog - $10 Million Worst-First Budget - Total Lane Miles
Backlog Treatment


Network Backlog - $20 Million Optimized Budget
Backlog Treatment Cost
Backlog Treatment
DT Preventive Maintenance
DT Reconstruction
DT Reconstruction (Rigid)
DT Rehabilitation
DT Rehabilitation (Rigid)
DT Routine Maintenance (Rigid)
Network Backlog - $20 Million Worst-First Budget
Backlog Treatment Cost
Backlog Treatment
DT Preventive Maintenance
DT Reconstruction
DT Reconstruction (Rigid)
DT Rehabilitation
DT Rehabilitation (Rigid)
DT Routine Maintenance (Rigid)
Scenario Year Number

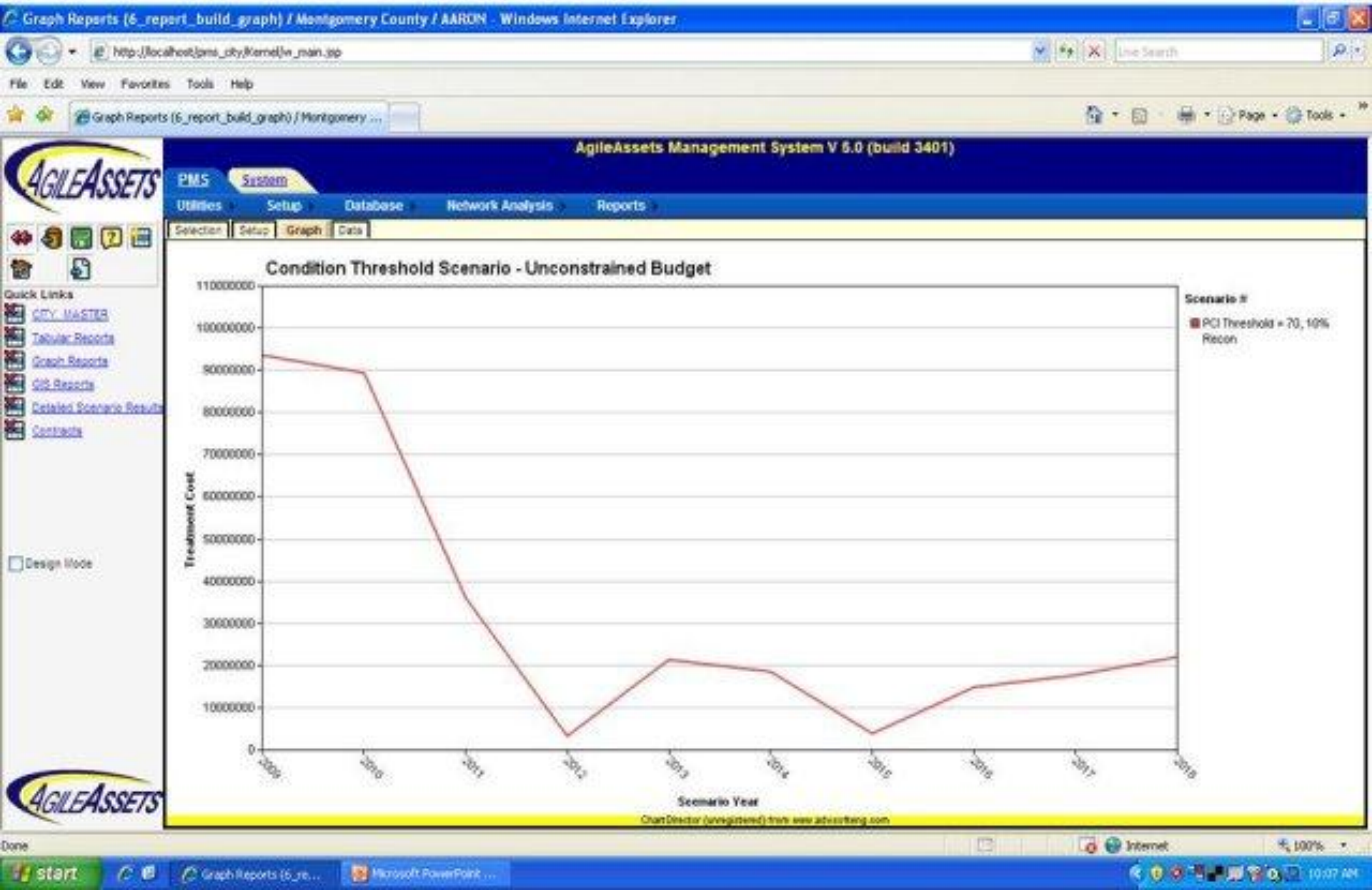
10 Yr. Comparison: Optimized vs. Worst-First

Funding Level	Worst-First	Optimized	Decrease in Backlog
$10,000,000	$680 Mil. PCI = 37	$550 Mil PCI = 48	**$130 Mil.**
$15,000,000	$630 Mil. PCI = 40	$470 Mil PCI = 54	**$160 Mil.**
$20,000,000	$570 Mil. PCI = 44	$370 Mil PCI = 59	**$200 Mil.**

Multi-Constraint Analysis

Goal Setting

Condition Threshold PCI=70, Recon <10%



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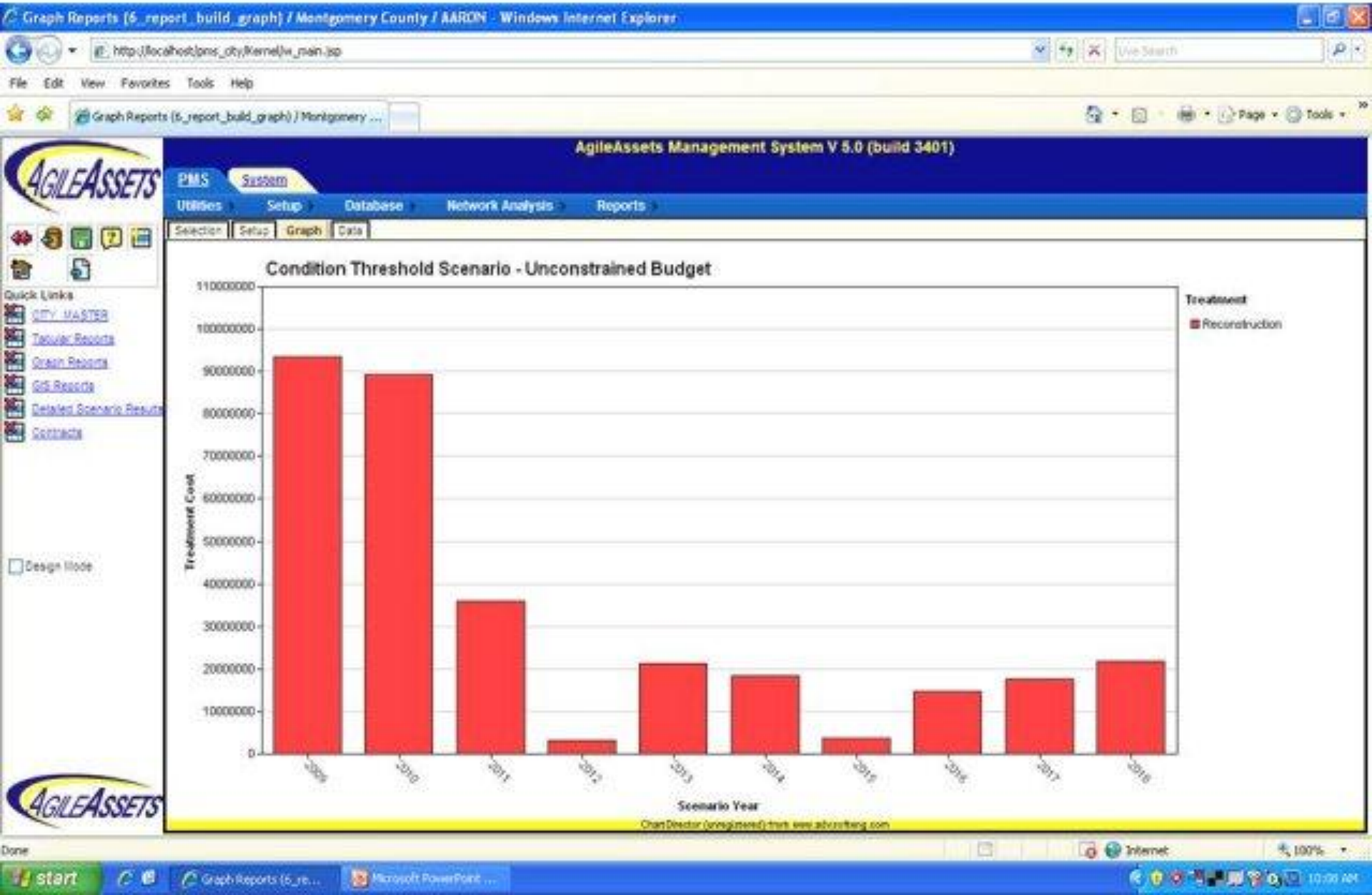


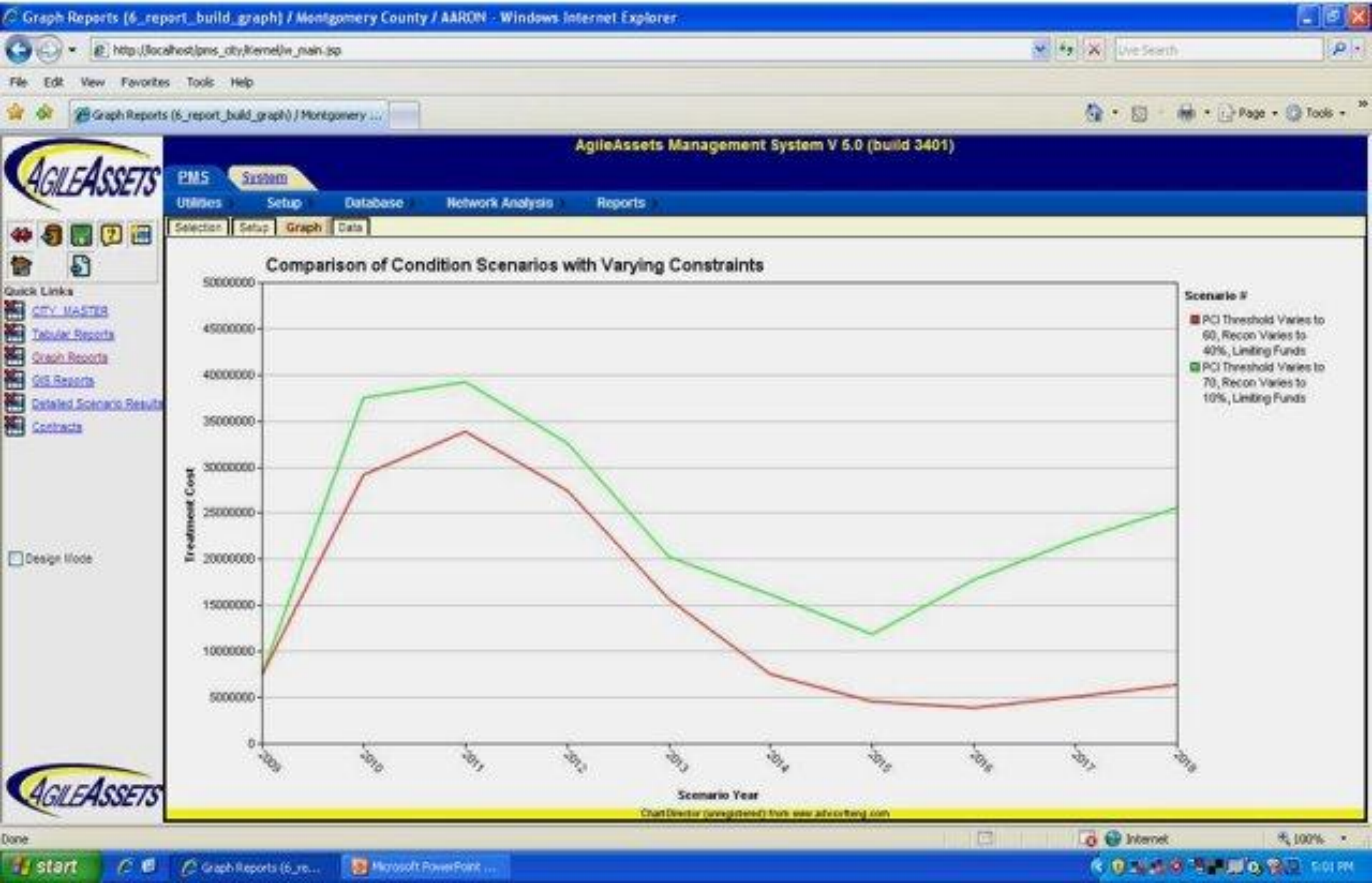
AgileAssets
Multi- Constraint Examples

Scenario No. 41 – PCI Threshold Varies to 70, Reconstruction Varies to 10%, Limiting Funds

Year	Option 1		Option 2	
	Maximum % Reconstruction	Minimum PCI	Maximum % Reconstruction	Minimum PCI
1	45	56	50	56
2	45	58	49	57
3	40	60	48	58
4	35	62	47	59
5	30	64	46	60
6	25	66	45	60
7	20	68	44	60
8	15	70	43	60
9	10	70	42	60
10	10	70	40	60

Multi-Constraint Analysis

Goal Setting



Condition Threshold PCI=70, Recon <10%, By Repair Category

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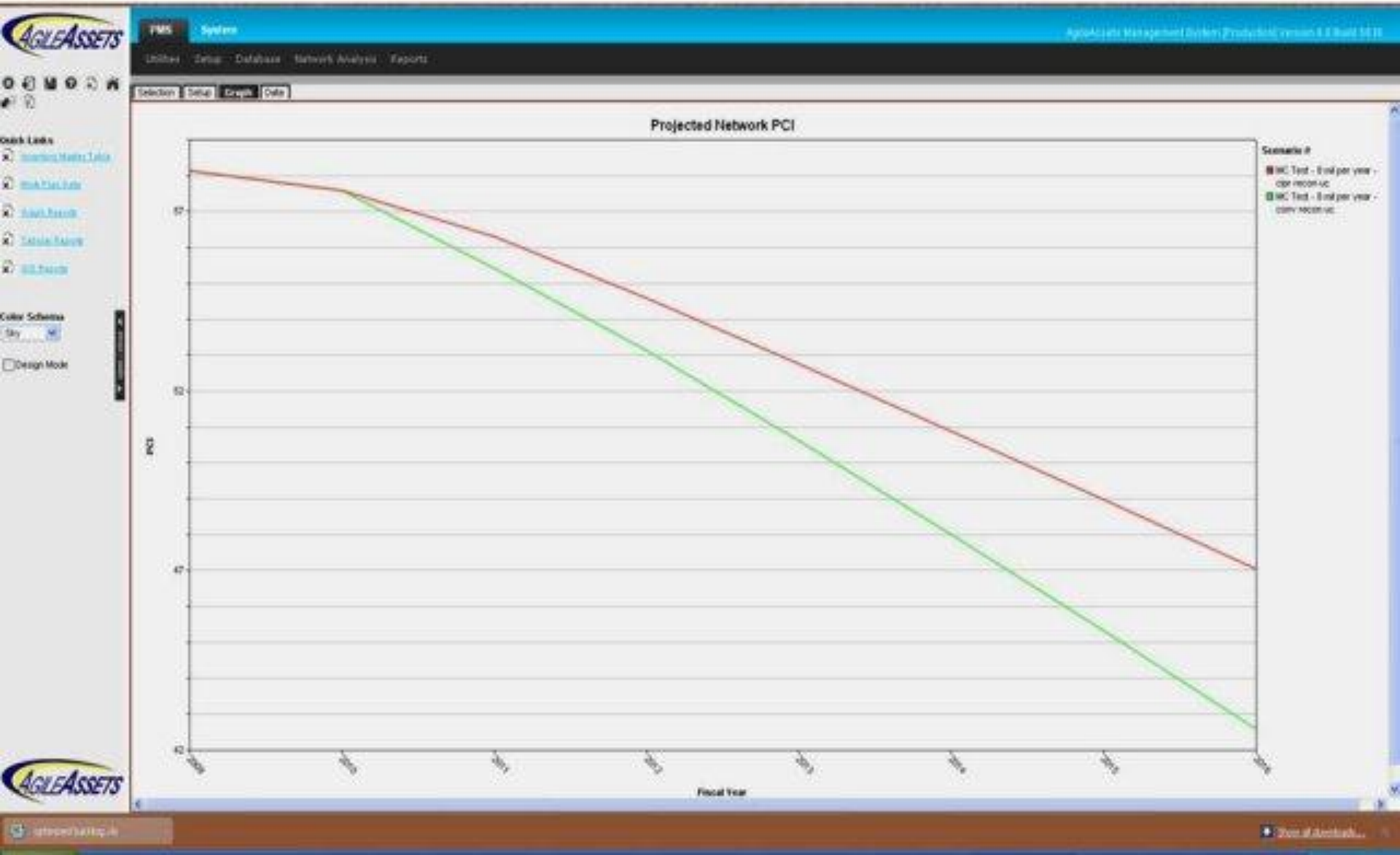
Backlog Analysis

Comparison of Different Repair Alternatives

CIR vs. Tradition Recon

Cold In-place Recycling vs. Traditional Reconstruction

$8 Million Per Year



Cold In-place Recycling vs. Traditional Reconstruction

$8 Million Per Year

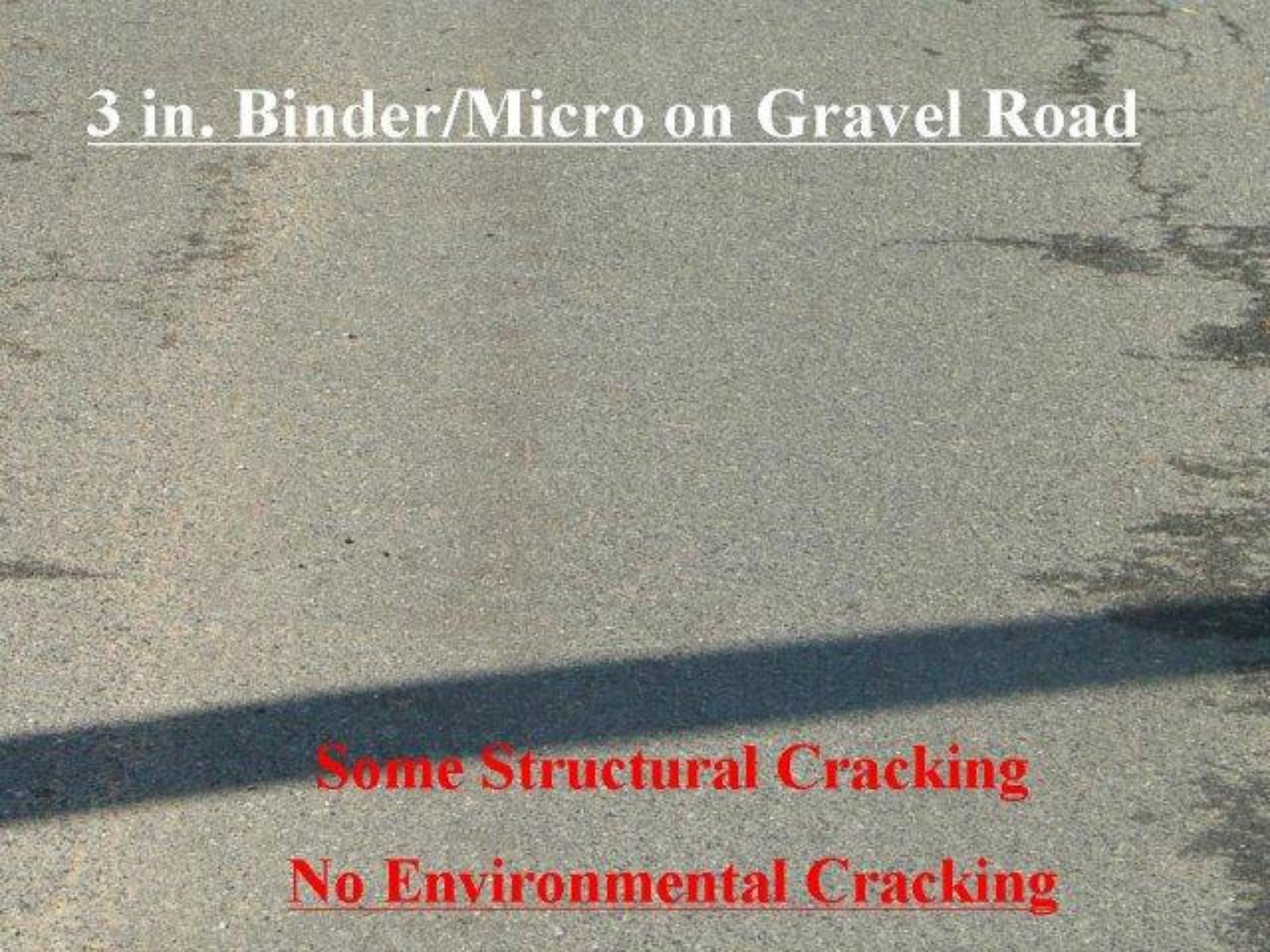
Project Level Tools

Micro-Surfacing Project

- In 1995 – Pavement Management Analysis
  - Thin HMA w/ Little Base
  - Most Streets – M/H Severity Fatigue Cracking
    - Selected Repair – FDR w/ Cement
- Town-wide Waterline to be installed in 3 Years
  - Decided to Seal, Patch & Micro

2008

13-year old Sacrificial Layer


3 in. Binder/Micro on Gravel Road
Some Structural Cracking
No Environmental Cracking

Cold In-place Recycling

- Main road through an Industrial Park
  - Trash Transfer Station
    - More than 200 Trash Trucks/day - 6 days a week
    - 20 Trailers per day - 6 days a week
  - Concrete Plant
  - Crane Rental Business
  - Several Manufacturers
  - Many Warehouses

Cold In-place Recycling

- Pavement Cross-Section
  - 6 to 16 inches of Asphalt/Aggregate
  - "Evolutionary" Road (widened twice)
- Pavement Condition
  - Severe structural failure
  - Severe Cross-Slope and Profile Problems
- In 1994 - 5 inch CIR Base & 2 inch Overlay

Historical Data

- **Work Histories**
  - Track all Work Done to a Segment
  - Contract Based
  - Historical Repository – Attach Documents, Photos, etc.
  - Very Helpful for:
    - Design of Repairs
    - Development/Update of Performance Models
- **Pavement Layer Information**
  - Automatically Built by Entering Work Histories
- **Condition Histories**

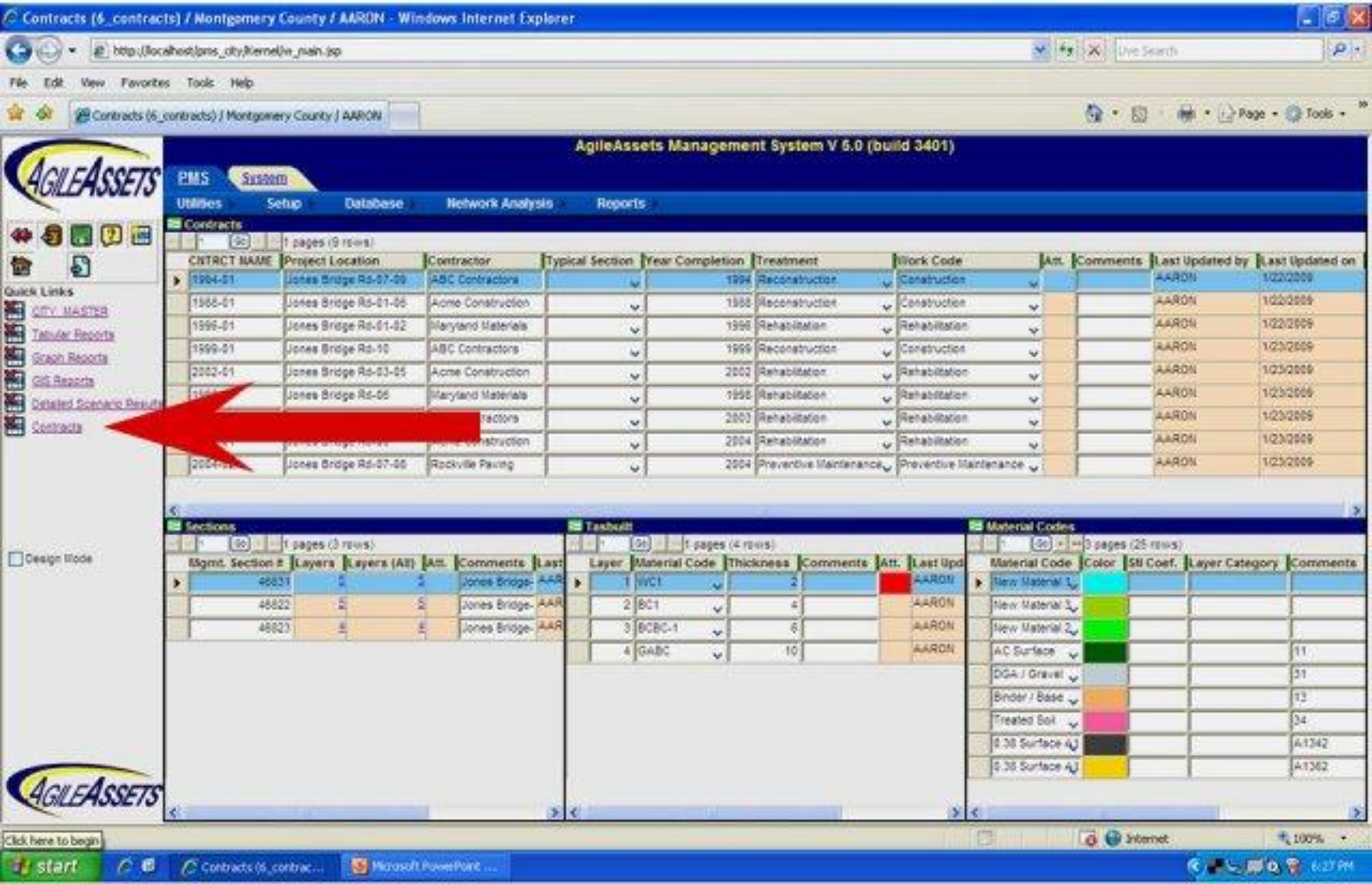
Project Level

- **Work Histories**
  - Track all Work Done to a Segment
  - Contract Based
  - Historical Repository – Attach Documents, Photos, etc.
  - Very Helpful for:
    - Design of Repairs
    - Development/Update of Performance Models
- **Pavement Layer Information**
- **Condition Histories**

Research Tool

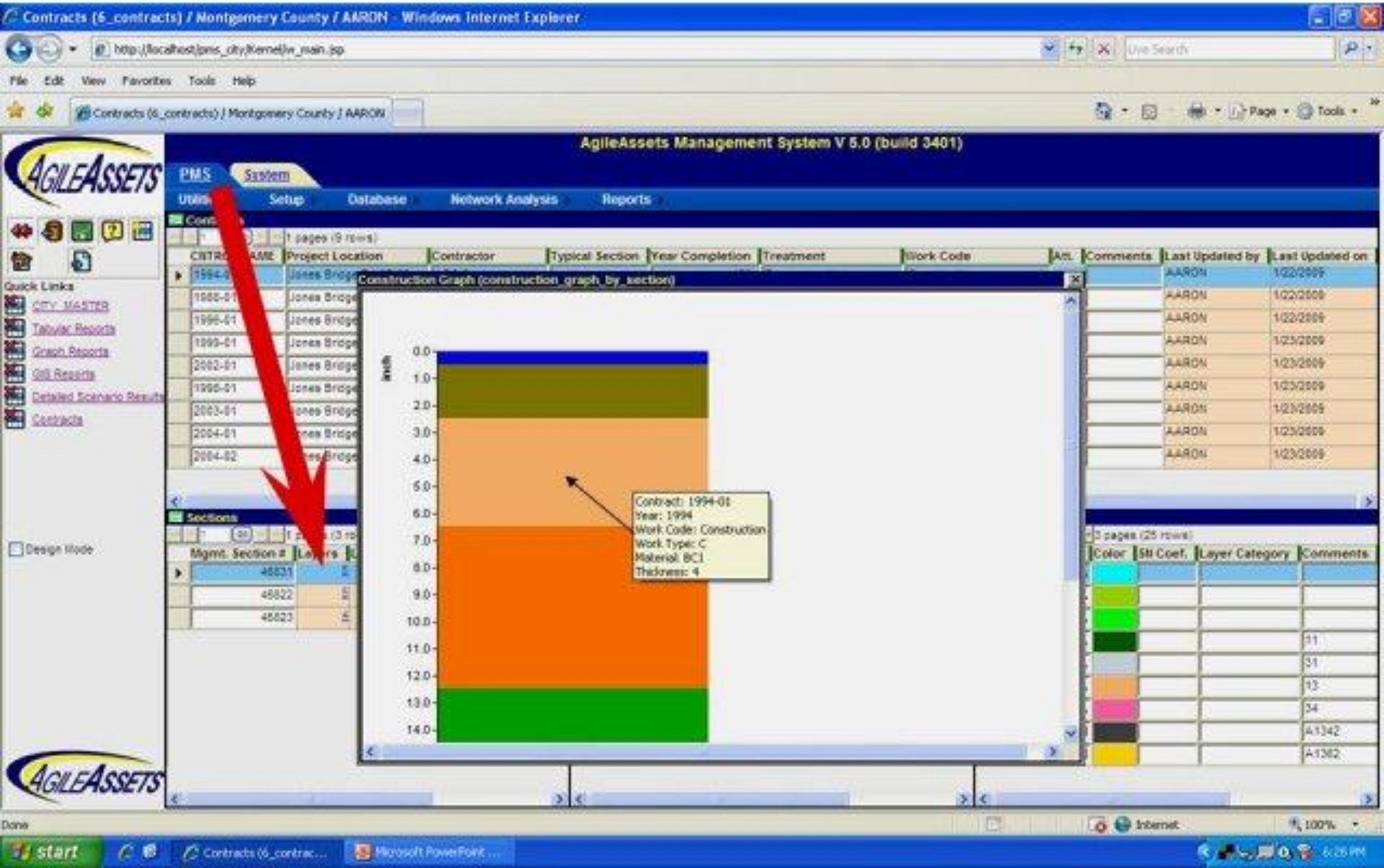
- Reviewing Performance data
  - What works vs. What doesn't
- Fine tuning decision models
  - Creating more classifications
    - thick vs. thin
    - w/ micro & w/o micro
    - w/ GABC vs. FDR vs. CIR
    - good vs. poor drainage

Work Histories



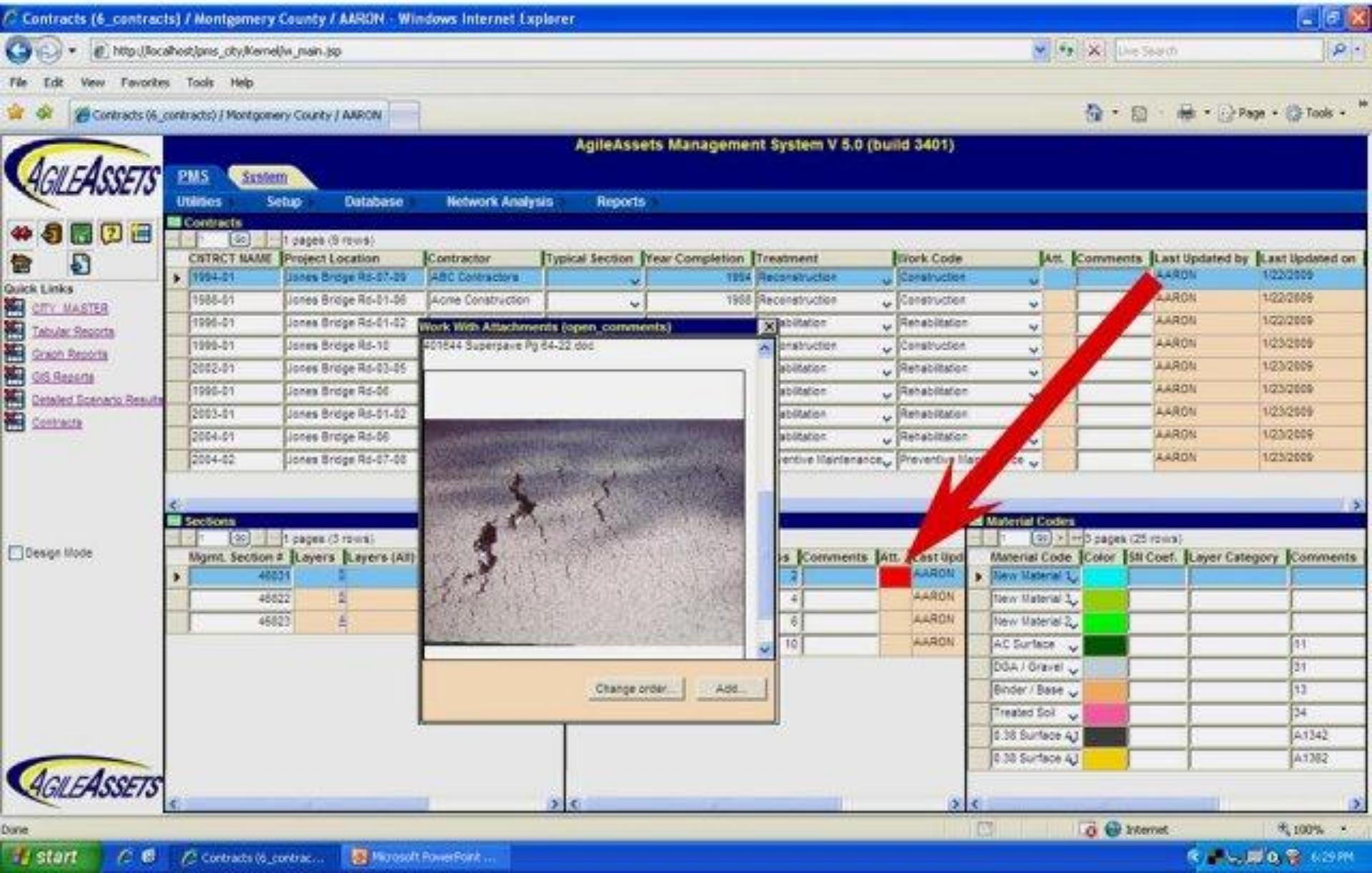
Work Histories

Pavement Layer Info



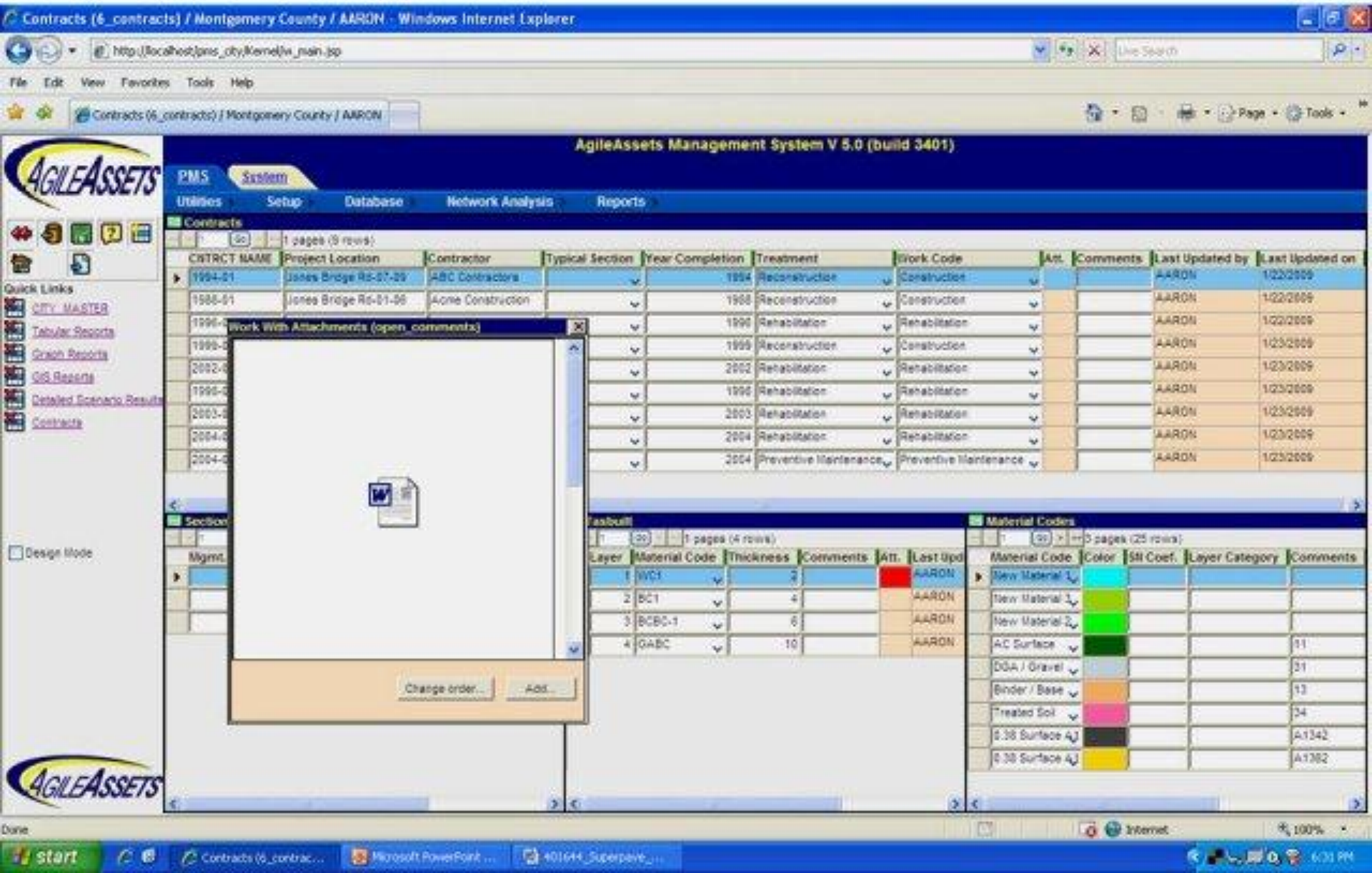
Work Histories

Attachments



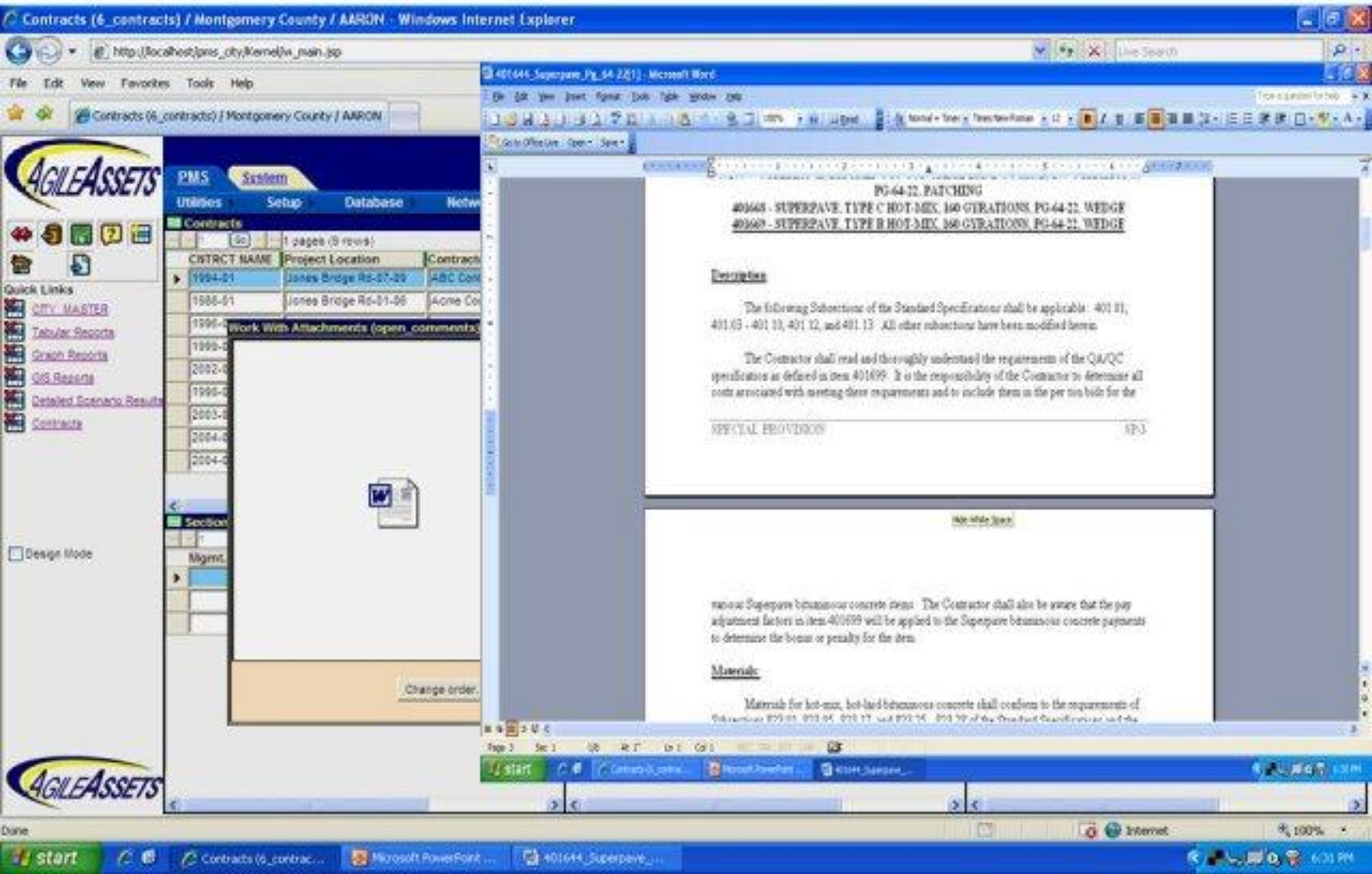
Work Histories

Attachments

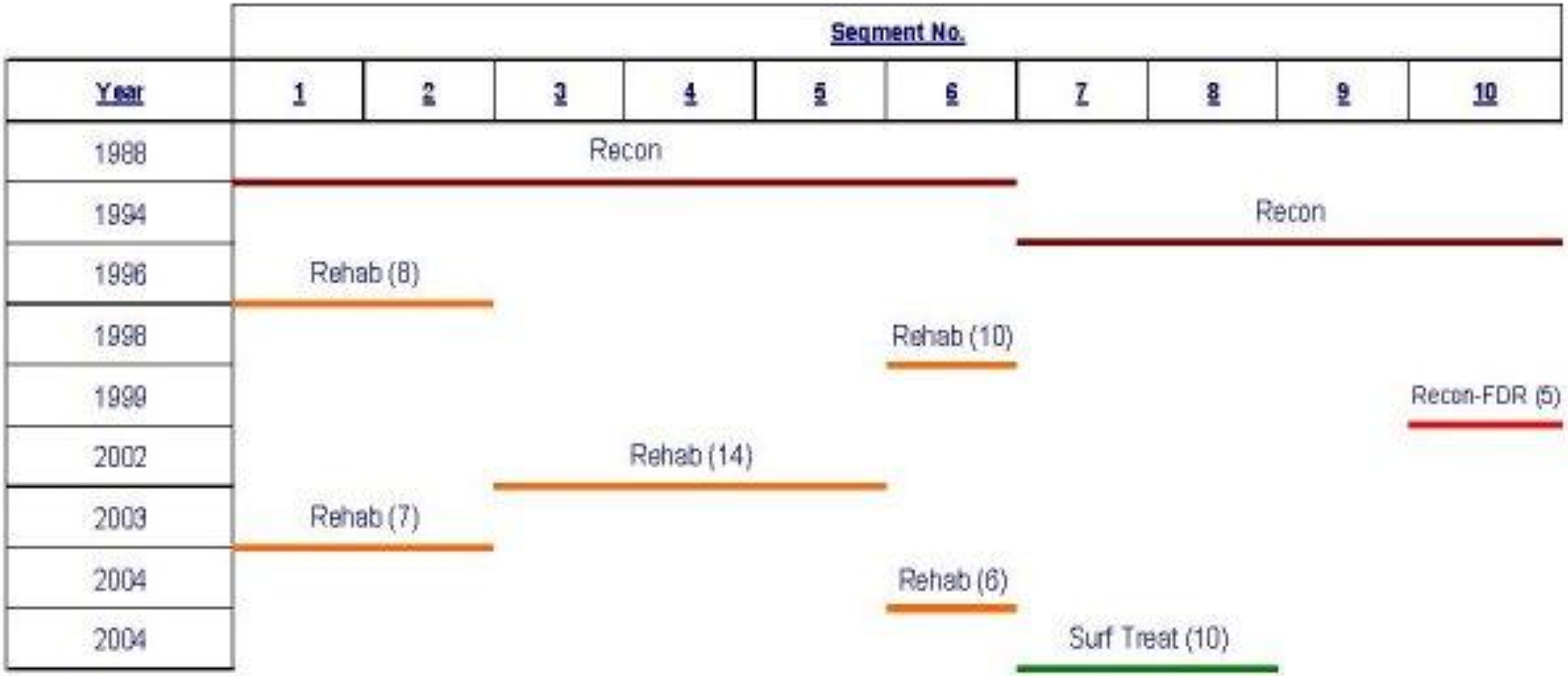


Work Histories

Attachments



Condition History



Current PCI	**55**	**50**	82	78	84	**68**	93	91	51	76
Years since Treat	**5**	**5**	6	6	6	**4**	4	4	14	9
Current Treatment	**Rehab**	**Rehab**	Routine	Surf	Routine	**Surf**	None	None	Rehab	Surf
Possible Issue	✓	✓	?	?	?	✓				

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Montgomery County Pavement Management System

Questions?